

WHAT IS CLAIMED IS:

1. A method of manufacturing an embedded multilevel interconnection, comprising:

5 a step of forming a hole portion in an insulating layer;

a barrier metal film forming step of forming a barrier metal film mainly made of tantalum and nitrogen in such a manner that the barrier metal film covers at least an inner wall of the hole portion, an element composition ratio
10 (N/Ta) of nitrogen to tantalum contained in the barrier metal film being 0.3 or higher but 1.5 or lower;

a removal step of removing an oxide film formed on a surface of the barrier metal film; and

an electroless plating step of immersing the barrier
15 metal film in a plating liquid comprising copper and thereby forming an electroless copper plating film on the barrier metal film.

2. The method according to claim 1, wherein the element composition ratio (N/Ta) is 0.3 or higher but 1.0
20 or lower.

3. The method according to claim 1, wherein the barrier metal film forming step is a plasma nitriding step at which nitrogen plasma is irradiated upon a surface of a film which is mainly made of tantalum and accordingly
25 nitriding tantalum.

4. The method according to claim 1, wherein the removal step is such a step at which the oxide film is removed and the barrier metal film is left in such a manner that the barrier metal film entirely covers the inner wall of the hole portion.

5. The method according to claim 1, wherein the removal step is such a step at which the barrier metal film is immersed in a solution selected from the group consisting of a mixture of a hydrofluoric acid and a nitric acid and a diluent of a hydrofluoric acid, and the oxide film is selectively removed.

6. The method according to claim 1, wherein the electroless plating step is such a step at which the barrier metal film is immersed in a plating liquid which uses a glyoxylic acid as a reducer.

7. The method according to claims 1, further comprising a step of forming an electrolytic copper plating film on the electroless copper plating film by using the electroless copper plating film as a seed layer.